PATENT SPECIFICATION

Application Date: July 17, 1929. No. 21,950/29. **336,950**

Complete Accepted: Oct. 17, 1930.

COMPLETE SPECIFICATION.

Improvements in Airships.

(A communication from abroad by THE SLATE AIRCRAFT CORPORATION, a corporation of the State of Nevada, United States of America, having its principle office at 920, Grandview Avenue, Glendale, California, United States of America.)

I, ALFRED HIRST WATKINS, of Metropolitan Chambers, Lichfield Street, Wolverhampton, in the County of Stafford, England, a subject of the King of Great Britain, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

The invention relates to airships of the type described in specification No. 302,413, that is to say in which there is a compensation bag positioned in the lower portion of the ship at the centre of buoyancy, said compensation bag including a rigid cup-shaped member mounted in a fixed position in the lower portion of the airship, a flexible bag mounted in and attached to the upper edge of the aforesaid rigid cup-shaped member and providing a chamber between the two members, a conduit which may be valve controlled for the flow of air to and from the chamber between the rigid cup-shaped member and the lower portion of the flexible bag and a conduit leading from the flexible bag to the propelling means of the airship. The invention consists in the provision of a valve in the said conduit leading to the propelling means, said valve being adjustable at will, whereby the quantity of gas taken from the bag can be suitably controlled.

The invention is described by reference to the accompanying drawings in which:—

Figure 1 is a longitudinal section of the airship,

Figure 2 is an enlarged detail view in section of the compensation bag with its central compartment inflated.

Figure 3 is a similar view with the central compartment of the compensation bag deflated.

Figure 4 is a similar view with the compensation bag as a whole deflated; and

Figure 5 is a transverse section through the airship.

Like numerals designate like parts in the respective views.

Referring to the accompanying drawings, I provide a compensation bag mounted at the center of buoyancy of the airship, immediately over the passenger and freight compartment. This device consists of an inverted dome-shaped outside cover 5 extending from near the bottom of the ship to a stationary ring 6 which is suitably braced by the suspension wires 7 attached to the ribs or wall of the airship so that the outside cover always keeps the same position in the ship as shown. Within the rigid shell 5 is a flexible gas bag, the flexible portion or diaphragm 10 of which is contained within the shell 5 and the upper flexible portion or diaphragm 8 of which, when inflated, extends above the ring 6 to form an inverted funnel-shaped bag. As shown in Figs. 2, 3 and 4, a space 40 is provided between the lower portion 10 of the flexible gas bag and the rigid shell 5.

I provide a gas compartment 39, which may be filled with a power gas such as natural gas, coal gas, or water gas, preferably natural gas or any other gas rich in heat units and lighter than air. The purpose of this gas compartment is to utilize the space occupied by the compensation bag to carry the fuel supply for the ship. The lower and outer funnel-shaped cover 5 of the compensation bag is provided with an outlet 11 communicating with the atmosphere to allow air to breathe in and out in connection with chamber 40 between the diaphragm 10 of the flexible compensation bag and the rigid outer cover 5 to cause the diaphragm 10 to contract or expand. Outlet 11 is provided with a valve 41. Upper diaphragm 8 of the compensation bag will occupy practically its full position when the ship is at anchor near the ground. At the end of a long trip the fuel gas between the lower diaphragm 10 of the compensation bag and the upper diaphragm 8 will have been mostly used up,

[*Price* 1/-]

Price 2/-

and the lower diaphragm 10 of the compensation bag will have risen accordingly and its relation to ring 6 will be as shown in Fig. 3. When the ship takes a new supply of fuel gas the diaphragm 10 of the compensation bag will drop approximately to the position shown in Fig. 2 and the ship will be ready for another trip.

I provide suitable engines 57 in the power plant compartment 3. I provide an intake pipe 19 in connection with the interior of the flexible compensation bag as shown in Figures 2, 3 and 4. Referring to Figure 1, I provide a valve-controlled re-filling pipe 21 in connection with the same compartment as pipe 19.

Referring to Figure 1, I preferably provide a pulsating bag 43 in communication with the fuel supply pipe 19 and with the pipe 45 leading to the manifold 46 of engines 57. Engines 57 are operatively connected with fan shaft 56 by the chains 55. The fan shaft also carries the starting motor 49 which is operated by the fuel pressure passing through pipe 47 from the liquefied gas pressure tank 50. Tank 50 is surrounded by a suitable insulating jacket 51. Jacket 51 is provided with vents 52 and 53 and a circulating fan or blower 54 is provided in the path of one of these vents.

As shown in Figure 1, I provide a passageway 67 having suitable steps or ladder to afford convenient access to the engine room.

At landing stations a fresh supply of liquid gas is taken aboard the ship as a cold liquid under little if any pressure and the tanks 50 are filled and sealed so that as the temperature rises they will build up a pressure to the point necessary for the operation of the system. The rate of evaporation may be increased by the circulation of the ship's hydrogen through the insulation of the tanks to keep the necessary amount of pressure. While the ship is standing at the station and the engines running only under partial capacity to hold the ship in a practically stationary position against whatever amount of wind there may be at the time, the liquid fuel is being vaporized and the large amount of air space in the compensation bag is being displaced with fuel vapor which tends to make the ship lighter.

When the airship is ready to leave a landing station a volume of fuel gas will be evaporated from its liquid state and run to the compensation bag, driving out a large volume of air from the bag and resulting in increased buoyancy of the airship when it starts on its journey. The increased buoyancy resulting from the extra supply of fuel vapor in the compensation bag will cause the ship to rise to a higher flying level. When it is desired to have the ship descend the evaporation of the liquid fuel gas is slowed down by the operator to a point where the engines are using the reserve fuel vapor from the compensation bag and a volume of air to take its place is admitted to the bag through vent or pipe 11. This decreases the buoyancy of the ship and results in a natural descent to the next station or depot.

The conduits 11 and 19 to the compensation bag are equipped with valves 41 and 44 which enable the operator to control the flow of fuel vapor to the engines and the intake of air to the compensation bag as shown in Figure 5. In emergency, control of the ship may be maintained as follows: If diaphragm 8 should develop a leak, valve 44 may be closed and use of the fuel vapor compartment discontinued temporarily and the ship will get its compensation automatically by air flowing in and out through pipe 11. If the compensation bag lower diaphragm 10 should develop a leak, valve 41 can be closed and compensation effected completely with the fuel vapor through pipe 19. Or valve 44 may be closed and the entire space occupied by air and fuel vapor in the compensation bag be filled with air to effect compensation automatically through pipe 11.

The entire ship is metal and non-inflammable and the main shell or casing 1 may therefore be filled with hydrogen gas and be practically as safe as it would be with helium. Compensation for gas expansion in the ship is cared for by a fixed compensation bag in approximately the centre of lift and in the lower half of the ship. This causes the ship to stand on an even keel of its own accord by reason of the fact that the ship is entirely rigid and if one end should occupy a position lower than the other it will be displacing heavier air and thereby have its lifting power at that end increased, while the other end displacing lighter air will have its lifting power decreased.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:—

1. An airship of the lighter than air type, having a compensation bag positioned in the lower portion of the ship at the centre of buoyancy, said compensation bag including a rigid cup-shaped member mounted in a fixed position in the lower portion of the air-

ship, a flexible bag mounted in and attached to the upper edge of the aforesaid rigid cup-shaped member and providing a chamber between the two members for containing fuel gas, and a conduit for the flow of air to and from the chamber between the rigid cup-shaped member and the lower portion of the flexible bag, characterised in that the means for supplying fuel gas from the compensation bag to the propelling means are controlled by a valve to regulate the quantity of gas taken from the bag.

Dated this 16th day of July, 1929.
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Metropolitan Chambers, Wolverhampton,
Agents for the Applicant.

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Fig. 2.

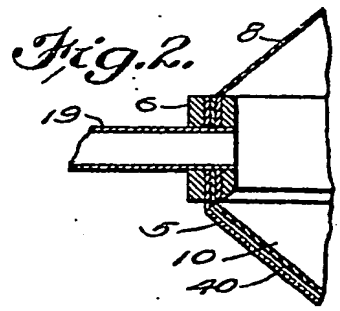


Fig. 3.

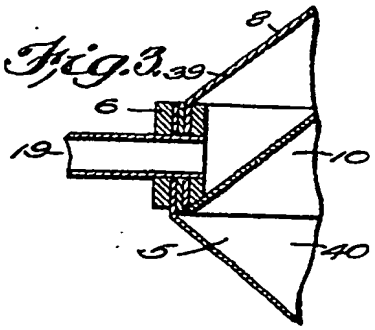
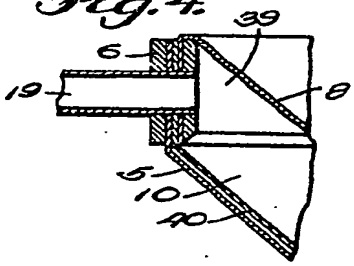


Fig. 4.



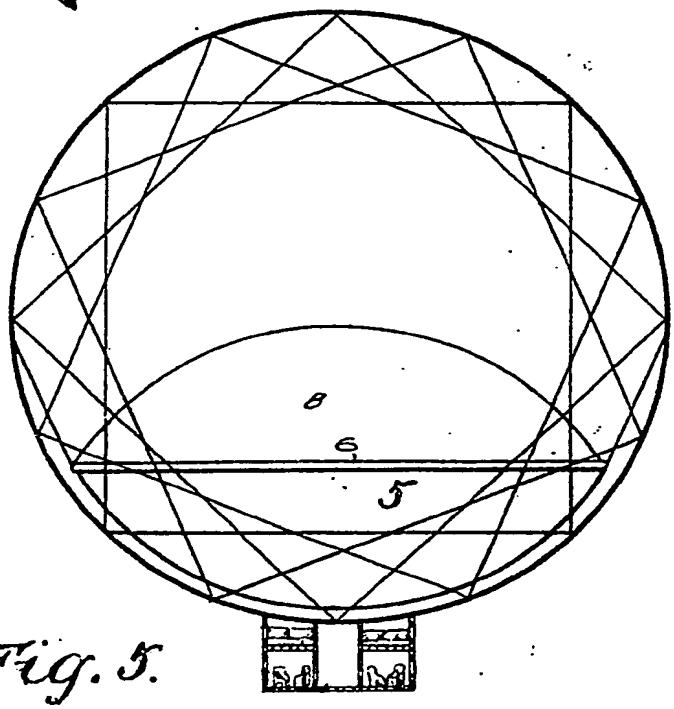


Fig. 5.

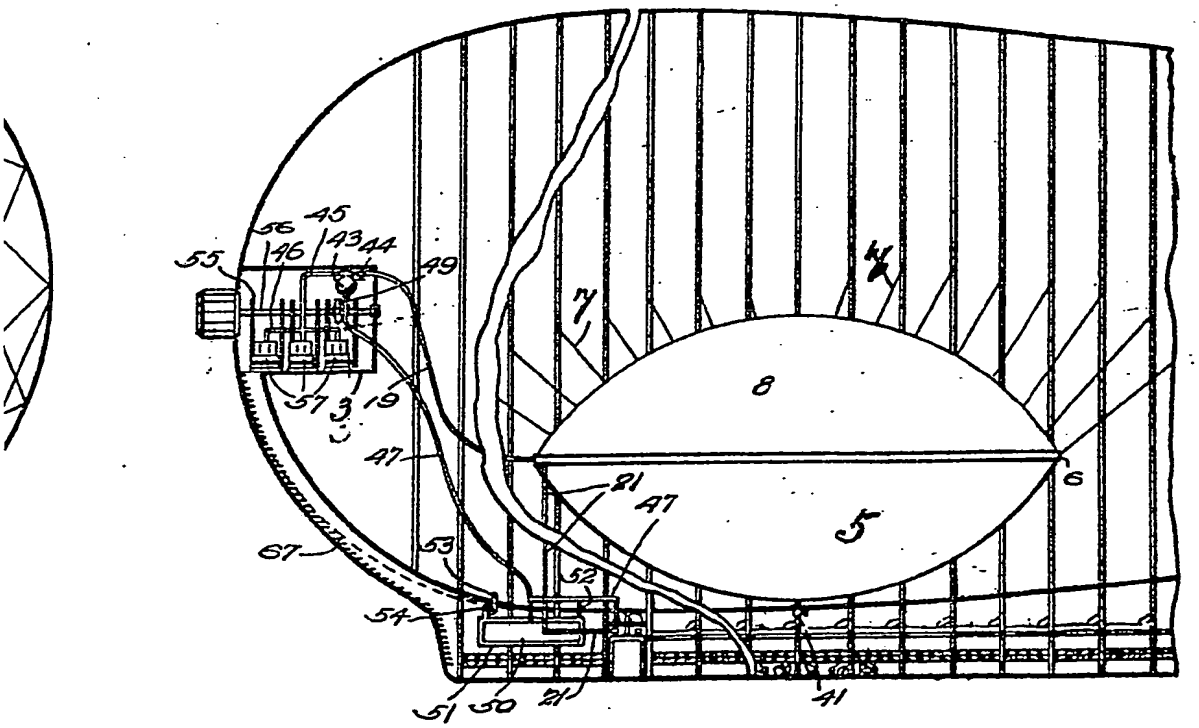


Fig. 1.

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Fig. 2.

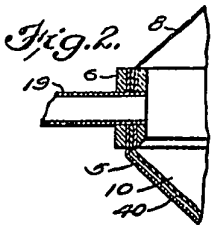


Fig. 3.

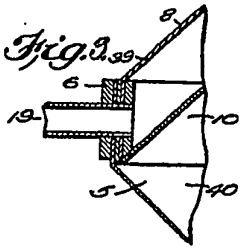
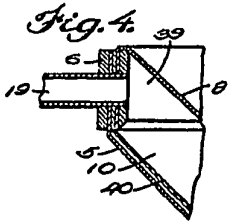


Fig. 4.



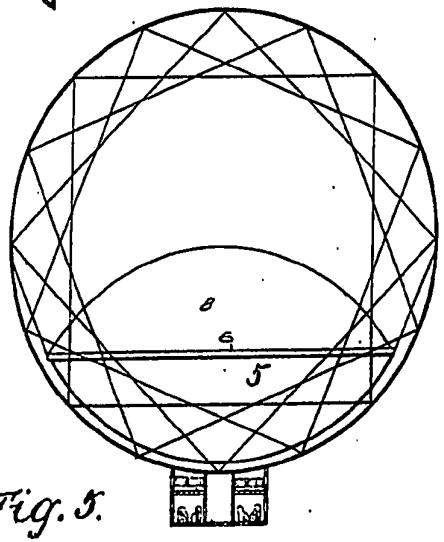


Fig. 5.

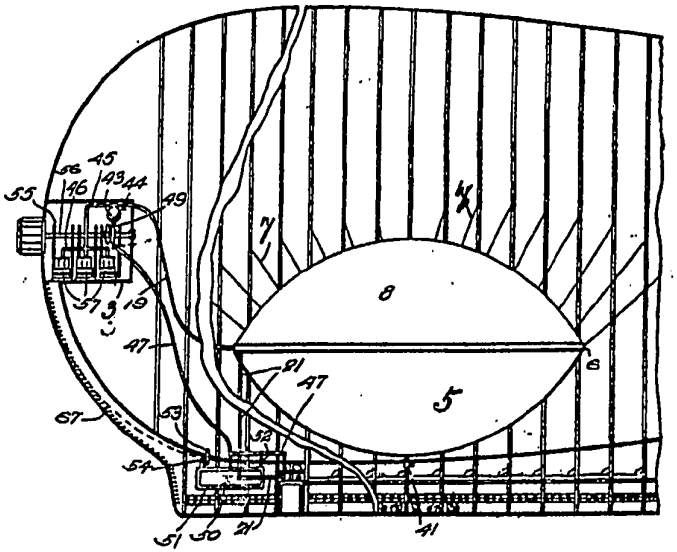


Fig. 1.